

APR 14 2009

Docket No. F-8488

Ser. No. 10/517,895

AMENDMENTS TO THE CLAIMS:

Please replace the claims with the claims provided in the listing below wherein status, amendments, additions and cancellations are indicated.

1. (Canceled)

2. (Canceled)

3. (Currently Amended) A rolling bearing apparatus, comprising:
a rolling element formed as an inner ring of a bearing;
a non-rolling element disposed concentrically with said rolling element;
a rotation detector for outputting an induced voltage produced by an input exciting voltage according to a relative rolling state of said rolling element and said non-rolling element;

said rotation detector comprising:

a rotor provided as part of said inner ring;
a stator provided on said non-rolling element; and
an exciting winding and output windings wound to
said stator, wherein

Docket No. F-8488

Ser. No. 10/517,895

said output windings output the induced voltage induced according to a gap permeance between said rotor and said stator in response to said exciting voltage inputted to said exciting winding;

said stator including a plurality of polar teeth opposing said rolling element, and said exciting winding and output windings being wound to each of said polar teeth of said stator, and

said rotor comprising a flat portion on a portion of a circumferential surface of said inner ring which opposes and is sensed by said plurality of polar teeth and is an outer peripheral shoulder of said inner ring.

4-9. (Canceled)

10. (Previously Presented) A rolling bearing apparatus, comprising:
a rolling element;
a non-rolling element disposed concentrically with said rolling element;
a rotation detector for outputting an induced voltage produced by an input exciting voltage according to a relative rolling state of said rolling element and said non-rolling element;

Docket No. F-8488

Ser. No. 10/517,895

said rotation detector comprising:

a rotor provided on said rolling element;

a stator provided on said non-rolling element; and

an exciting winding and output windings wound to

said stator, wherein

said output windings output the induced

voltage induced according to a gap permeance

between said rotor and said stator in response to said

exciting voltage inputted to said exciting winding;

said rolling element comprising:

a hub wheel having first and second axial ends, said

hub wheel having in sequential order from said first axial

end a flange provided proximate said first end, an

intermediate circumferential surface having a first diameter,

a ring seat surface having a ring seat diameter less than said

first diameter, and a threaded portion having an outer thread

diameter less than said ring seat diameter; and

an inner ring mounted on said ring seat surface;

Docket No. F-8488

Ser. No. 10/517,895

said non-rolling element being an outer ring disposed on an outer periphery of said hub wheel;

said stator being mounted in an axially center region of an inner circumferential surface of said outer ring; and

said rotor being formed by at least one notch provided at an area on said intermediate circumferential surface of said hub wheel.

11. (Currently Amended) A rolling bearing apparatus, comprising:
a rolling element;
a non-rolling element disposed concentrically with said rolling element;
a rotation detector for outputting an induced voltage produced by an input exciting voltage according to a relative rolling state of said rolling element and said non-rolling element;

said rotation detector comprising:

a rotor provided on said rolling element;
a stator provided on said non-rolling element; and
an exciting winding and output windings wound to
said stator, wherein

said output windings output the induced voltage
induced according to a gap permeance between said rotor

Docket No. F-8488

Ser. No. 10/517,895

and said stator in response to said exciting voltage inputted to said exciting winding;

said rolling element comprising:

a hub wheel having first and second axial ends, said hub wheel having in sequential order from said first axial end a flange provided proximate said first axial end, an outer raceway circumferential portion with a first [[outer]] inner raceway groove having a first [[outer]] inner raceway groove diameter, an intermediate circumferential surface having a first diameter, a ring seat surface having a ring seat diameter less than said first diameter, and a threaded portion having an outer thread diameter less than said ring seat diameter; and

an inner ring mounted on said ring seat surface and having a second inner raceway groove having a second inner raceway groove diameter less than said first inner raceway groove diameter;

Docket No. F-8488

Ser. No. 10/517,895

said non-rolling element being an outer ring disposed concentrically with said hub wheel and having first and second [[inner]] outer raceway grooves in an inner circumferential surface of the non rolling element and respectively opposing said first and second inner raceway grooves;

a first set of balls disposed in said first inner and outer raceway grooves and having a first pitch circle diameter, a second set of balls disposed in said second inner and outer raceway grooves and having a second pitch circle diameter less than said first pitch circle diameter;

said stator being mounted in an axially center region of an inner circumferential surface of said outer ring; and

said rotor being formed by notches provided at a plurality of areas on said intermediate circumferential surface.

12. (Previously Presented) A rolling bearing apparatus, comprising:
 - a rolling element in the form of an inner bearing ring;
 - a non-rolling element disposed concentrically with said rolling element, said non-rolling element being in the form of an outer bearing ring;
 - a rotation detector for outputting an induced voltage produced by an input exciting voltage according to a relative rolling state of said rolling element and said non-rolling element;

Docket No. F-8488

Ser. No. 10/517,895

a generator for generating a voltage using energy provided by relative rotation of said rolling element relative to said non-rolling element and inputting the voltage as an input exciting voltage to said rotation detector, said generator having a first portion mounted to said inner bearing ring and a second portion mounted to said outer bearing ring, said generator comprising:

 a generating rotor provided as said first portion in said rolling element by disposing magnetic poles with different polarities alternately in a circumferential direction; and

 a generating stator provided as said second portion in said non-rolling element and having an electric coil opposing the magnetic poles of said generating rotor in an radial direction, the electric coil producing the voltage input as said exciting voltage; and

 said rotation detector comprising:

 a rotor provided on said rolling element;
 a stator provided on said non-rolling element; and
 an exciting winding and output windings wound to
 said stator, wherein

Docket No. F-8488

Ser. No. 10/517,895

said output windings output the induced voltage induced according to a gap permeance between said rotor and said stator in response to said exciting voltage inputted to said exciting winding.

13. (Cancelled)

14. (Previously Presented) The rolling bearing apparatus according to claim 3, further comprising a radio transmitter for radio-transmitting signals outputted from said rotation detector to a signal processing unit provided outside.

15. (Previously Presented) The rolling bearing apparatus, comprising:
a rolling element;
a non-rolling element disposed concentrically with said rolling element;
a rotation detector for outputting an induced voltage produced by an input exciting voltage according to a relative rolling state of said rolling element and said non-rolling element;
said rotation detector comprising:
a rotor provided on said rolling element;
a stator provided on said non-rolling element; and

Docket No. F-8488

Ser. No. 10/517,895

an exciting winding and output windings wound to
said stator, wherein

 said output windings output the induced voltage
 induced according to a gap permeance between said rotor
 and said stator in response to said exciting voltage inputted
 to said exciting winding; and

 said stator including a plurality of polar teeth opposing said rolling element,
 and said exciting winding and output windings being wound to each of said polar
 teeth of said stator,

 said rotor comprising a flat portion on a portion of a circumferential surface
 of said rolling element which opposes said plurality of polar teeth;

 a radio transmitter for radio-transmitting signals outputted from said
 rotation detector to a signal processing unit provided outside; and

 a generator for generating a voltage using energy provided by relative
 rotation of said rolling element and said non-rolling element, and inputting the
 voltage as an input exciting voltage to said rotation detector while supplying the
 voltage as a driving voltage to said radio transmitter, said generator comprising:

Docket No. F-8488

Ser. No. 10/517,895

a generating rotor provided to said rolling element by disposing magnetic poles with different polarities alternately in a circumferential direction; and

a generating stator provided to said non-rolling element and having an electric coil opposing the magnetic poles of said generating rotor in an radial direction, the electric coil producing the voltage input as said exciting voltage.

16. (Previously Presented) The rolling bearing apparatus according to claim 3, further comprising a signal processing unit for processing output signals from said rotation detector.

17. (Original) The rolling bearing apparatus according to claim 12, further comprising a signal processing unit for processing output from said generator.

18. (Original) The rolling bearing apparatus according to claim 14, further comprising a signal processing unit for processing output signals from said radio transmitter.

Docket No. F-8488

Ser. No. 10/517,895

19. (Previously Presented) The rolling bearing apparatus according to claim 3, wherein said rotation detector comprises a resolver which induces the voltage according to a gap permeance between said rotor and said stator in response to an exciting voltage inputted to said exciting winding from said output windings.

20. (Previously Presented) The rolling bearing apparatus according to claim 3, wherein said non-rolling element opposes said rolling element at least in part in a radial direction of the rolling bearing apparatus.

21. (Currently Amended) A rolling bearing apparatus, comprising:

- a rolling element including a first raceway wheel;
- a non-rolling element disposed concentrically with said rolling element and including a second raceway wheel, said rolling element rolling with respect to said non-rolling element;
- a rotation detector providing an induced voltage output produced from an input exciting voltage and influenced according to a gap permeance related to a relative rolling state of said rolling element and said non-rolling element;
- a rotor disposed in said rolling element;
- a stator disposed in said non-rolling element;

Docket No. F-8488

Ser. No. 10/517,895

an exciting winding and output windings disposed on said stator, said exciting winding being excited by said exciting voltage and said output winding providing said induced voltage output;

said rotor and said stator being disposed opposing one another in an annular space between said rolling element and said non-rolling element; and

said output windings outputting said induced voltage output at a level determined by the gap permeance between said rotor and said stator and by said input exciting voltage,

wherein said rolling element is an inner ring of a bearing and said non-rolling element is an outer ring of the bearing, and said rotor is formed of the inner ring and includes a flat portion of an outer circumferential surface of the inner ring sensed by the stator.